

**CLEAN VERSION OF ALL PENDING CLAIMS**

38. (Twice Amended) An article comprising:  
a substrate; and  
a layer disposed over the substrate, the layer comprising a highly tetrahedral amorphous carbon having more than about 15%  $sp^3$  carbon-carbon bonds and a single peak Raman spectrum, the layer further comprising at least one of hydrogen and nitrogen;  
wherein a percentage of  $sp^3$  carbon-carbon bonds in the layer increases as a layer thickness decreases.
39. (Previously Amended) An article as in claim 38, wherein the layer comprises between about 8 and 18 atomic percent hydrogen.
40. (Previously Amended) An article as in claim 38, wherein the layer comprises between about 4 and 30 atomic percent nitrogen.
41. (Previously Amended) An article as in claim 40, wherein electrical conductivity of the layer varies with the nitrogen percentage.
42. (Previously Amended) An article as in claim 41, wherein the electrical conductivity of the layer varies by 5 orders of magnitude.
43. (Previously Amended) An article as in claim 38, wherein the  $sp^3$  carbon-carbon bonds are stable at about 700°C.
44. (Previously Amended) An article as in claim 38, wherein the layer is smooth and continuous.
45. (Previously Amended) An article as in claim 38, wherein the layer comprises more than about 35%  $sp^3$  carbon-carbon bonds.

E

46. (Previously Amended) An article as in claim 38, wherein the layer comprises more than about 70% sp<sup>3</sup> carbon-carbon bonds.

48. (Previously Added) An article as in claim 38, wherein the single peak Raman spectrum has a maximum peak intensity at about 1518 cm<sup>-1</sup>.

49. (Previously Added) An article as in claim 48, wherein the maximum peak intensity is associated with a G-peak .

50. (Previously Added) An article as in claim 38, wherein the single peak Raman spectrum has a width of about 175 cm<sup>-1</sup>.

51. (Previously Added) An article as in claim 38, wherein the single peak Raman spectrum is characterized by a generally smooth curve.

52. (Previously Added) An article as in claim 51, further comprising at least one localized secondary perturbation offset from the generally smooth curve.

53. (Previously Added) An article as in claim 38, wherein the layer has a thickness of less than about 75Å.

54. (Previously Added) An article as in claim 38, wherein the layer has a thickness of less than about 50Å.

55. (Previously Added) An article as in claim 38, wherein the layer has a hardness of over about 50 GPa.

56. (Previously Added) An article as in claim 38, wherein the layer has a hardness of about 80 GPa.

57. (Previously Added) An article as in claim 38, wherein the layer has a density of more than about 2.5 g/cm<sup>3</sup>.

E

58. (Previously Added) An article as in claim 38, wherein the layer does not include macroparticles.

59. (Amended) An article comprising:  
a substrate; and  
a layer disposed over the substrate, the layer comprising a highly tetrahedral amorphous carbon having more than about 15%  $sp^3$  carbon-carbon bonds and a single peak Raman spectrum, the layer further comprising at least one of hydrogen and nitrogen, wherein the  $sp^3$  carbon-carbon bonds are at least in part formed by directing an energized stream of carbon ions having a uniform weight and a substantially uniform impact energy toward the substrate.

*Please cancel claim 60.*

61. (Amended) An article as in claim 59, wherein the  $sp^3$  carbon-carbon bonds are at least in part formed by directing an energized stream of carbon ions toward the substrate with an ion impact energy between about 100 and 120 eV for each carbon atom.

62. (Amended) An article comprising:  
a substrate; and  
a layer disposed over the substrate, the layer comprising a highly tetrahedral amorphous carbon having more than about 15%  $sp^3$  carbon-carbon bonds and a carbon bonding pattern characterized by a single peak Raman spectrum;  
wherein a percentage of  $sp^3$  carbon-carbon bonds in the layer increases as a layer thickness decreases.

63. (Amended) An article comprising:  
a substrate; and

E

a layer disposed over the substrate, the layer comprising a highly tetrahedral amorphous carbon having more than about 15%  $sp^3$  carbon-carbon bonds and a carbon bonding pattern being free from a D-peak Raman spectrum;

wherein a percentage of  $sp^3$  carbon-carbon bonds in the layer increases as a layer thickness decreases.

PA 3214310 v1

E